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ABSTRACT

Research on teaching can be concerned with teaching in general or it can be conducted with a single kind of subject matter. Which kind of research is more advantageous? This issue arises in the planning of programs of research on teaching. The generic approach looks for uniformities, concepts, and principles that apply across all or many subject matters. The curriculum-specific approach is based on the assumption that subject matter does make a difference--in the kinds of teaching behavior, methods, strategies, styles, and skills that the investigator needs to be concerned with and in the kinds of results that will be found. The arguments concerning the generic-specific issue in research on teaching can be grouped into three categories, each of which are dealt with in this paper: (1) those dealing with the generality of learning and teaching processes; (2) those dealing with the problem of multiplicity; and (3) those dealing with conceptualizations of the pedagogical domain. After examining these three areas, this paper proposes that research should be concentrated in a relatively small number of conjunctions of grade-level, subject matter, and socioeconomic level, i.e., the research approach used should be specific rather than generic. (JMK)

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Should Research on Teaching Be Generic or Specific?

N. L. Gage

Program on Teaching Effectiveness

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Research on teaching can be concerned with teaching in general, as it applies to all or at least a wide variety of subject matters. Or it can be conducted with a single kind of subject matter, such as elementary school reading. Which kind of research is more advantageous?

This issue arises in the planning of programs of research on teaching. The generic approach looks for uniformities, concepts, and principles that apply across all or many subject matters. It jumps from one subject matter to another almost as if the subject matter did not make much difference. The curriculum-specific approach is based on the assumption that the subject matter does make a difference--in the kinds of teaching behavior, methods, strategies, styles, and skills that the investigator needs to be concerned with and in the kinds of relationships to significant educational outcomes that he is likely to find.

Further, the issue applies to various phases of the teacher's work--both preinteractive (e.g., organization and planning) and interactive. It applies to different kinds of outcomes--both cognitive and social-emotional. It applies to different grade levels.

As one examines the literature of research on teaching, one gains the impression that it has been conducted from both of these two major points of view. On the one hand, in the major reviews of research on teaching, such as those by Rosenshine (1971) and by Dunkin and Biddle (1974), the role of the curriculum, or subject matter, has been subordinated. The

orientation conveyed is that the field of research on teaching has been engaged in a search for relationships between teaching processes (teacher behaviors, teacher-pupil interactions, teaching methods, teaching styles, strategies, skills, and the like) and student achievement or attitude that are general across various subject matters and grade levels. In making their collations of studies, these reviewers have neglected the differences between subject matters and grade levels and have combined studies across these two major kinds of distinctions. Whether they have done so advisedly and by preference, or whether they were forced to do so in order to obtain enough studies in any given cluster to justify some kind of generalization, has been unclear. But the fact remains that when they have brought together the studies on some kind of teacher behavior, such as "indirectness," or "criticism and disapproval," they have done so without regard to the subject matter and the grade level in which the teaching was going on.

Side by side with this kind of review and analysis of research on teaching there has always existed a curriculum-specific literature. One exemplification of that literature has been the chapters on "Research on Teaching [A Specific Subject Matter]," in the Handbook of Research on Teaching (Gage, Ed., 1963) and the Second Handbook of Research on Teaching (Travers, Ed., 1973). Thus, in both of these handbooks, there are chapters with such titles as "Research on Teaching Literature, Language and Composition," "Research on Teaching in the Natural Sciences," "Research on the Teaching of Elementary-School Mathematics." In these chapters, the research has indeed been brought together in clusters that bear upon the specific problems of teaching a particular kind of subject matter.

But both of these handbooks have also contained chapters representing the generic approach. For example, in the Second Handbook of Research on Teaching, the chapter on contemporary models of teaching (Nuthall & Snook, 1973) deals with the "behavior-control model," the "discovery-learning model," and the "rational model." All three of these models are described and analyzed without specific reference to any particular subject matter or grade level. And the Handbook of Research on Teaching contains chapters on teaching methods (Wallen & Travers, 1963), the teacher's personality and characteristics (Getzels & Jackson, 1963), and social interacting in the classroom (Withall & Lewis, 1963)--none of which refer specifically to particular curricula, subject matters, or grade levels.

Arguments on the Generic-Specific Issue

The arguments concerning the generic-specific issue in research on teaching can be grouped into several categories: (a) those dealing with the generality of learning and teaching processes; (b) those dealing with the problem of multiplicity; (c) those dealing with conceptualizations of the pedagogical domain. In this section, we deal with each of these categories in turn.

The Generality of Learning-Teaching Processes

It is possible to argue that research on teaching ought to be conducted without special regard for the particularities of subject matters and, even, grade levels. In this view, research on teaching is similar to research on learning, which has also in large part been conducted without specific regard to the kinds of categories that are imposed by special subject matters. When psychologists have investigated learning processes, they have been concerned with the learning of concepts, skills, principles, problem-solving, and creativity.

Thus, Gagné (1970) defined and analyzed a hierarchy of eight types of learning: signal learning, stimulus-response learning, chaining, verbal-associate learning, multiple-discrimination learning, concept learning, principle learning, and problem solving. These types of learning were defined without specific reference to particular school subject matters, such as reading, arithmetic, social studies, or French. Each of these eight types of learning presumably occurs in each of the various subject matters.

It is implicit in this conception of learning that a concept is basically the same kind of thing to be learned, regardless of whether it is a concept in reading or a concept in arithmetic. Thus, the concept of "consonant," as learned in reading, is similar in its psychological characteristics to the concept of "odd (versus even)" in arithmetic. The pupil presumably goes about learning each of these concepts in basically the same way, and he manifests that learning by his ability to respond to various instances of the same concept by giving the appropriate abstract category or name. Thus, when exposed to a collection of instances and noninstances of consonants, the child will show that he has learned the concept of consonant by correctly identifying which instance is a consonant and which is not. Similarly, when confronted with a series of numbers, the child will demonstrate that he has learned the concept of "odd" by correctly identifying which of the numbers is odd and which is not.

Similarly, in teaching these two concepts, the teacher might proceed in very much the same way, regardless of the fact that one of the concepts belonged to the subject matter of reading while the other belonged to the subject matter of arithmetic. In teaching the concept of consonant, the teacher might first proceed by giving a definition, such as "a consonant is a letter that stands for a certain kind of sound in speaking--a sound

that is made by stopping the air that comes out of your throat by certain movements of your speech organs. It is different from a vowel, which is a speech sound that is created by a relatively free passage of the air out of your throat through your speech organs and mouth." The teacher would then go on to give the instances of the two kinds of sounds, that is, of consonants and vowels. Because the vowels are fewer in number, the teacher would probably teach them first by saying that the vowels are the sounds that are represented by the following letters of the English alphabet: a, e, i, o, u, and sometimes y. All of the other letters of the alphabet are consonants. Then the teacher would go on to give the children practice in applying the concept of consonants by asking them to decide whether a given letter in a series of letters was a consonant or a vowel.

In teaching the concept of "odd" the teacher might proceed in very much the same way, except for the details of the subject matter. First, she would define the concept of oddness by saying something like "An odd number is a number that is not divisible by two. An even number is a number that is divisible by two. Examples of odd numbers are 1, 3, 5, 7, and so on. Examples of even numbers are 2, 4, 6, 8, and so on. You can always tell whether numbers that have more than one digit are odd numbers or even numbers by whether they end in an odd or even number. Thus, the number 27 is an odd number because it ends in 7, which is an odd number...."

The teacher would go on to teach the concept of odd (versus even) by giving children practice in making this distinction by asking them discriminate between many numbers of both kinds. When they had correctly identified many numbers of both kinds, the teacher would infer that they had learned the concept of odd (versus even).

The same procedure in general could be applied to the teaching of many other concepts in reading--plural, verb, period, sentence, paragraph, tense, and so on. In arithmetic, the additional concepts would include addition, subtraction, division, digit, fraction, whole number, mixed number, and ratio. In general, the teaching goes on through various combinations of definition, illustration, presenting instances both positive and negative, requiring discriminations, and the like. The fact that one set of concepts was specific to the curriculum in reading, while the other set was specific to the curriculum in arithmetic, would make no basic difference in the types of teaching that went on. Similarly, at some level of generality at least, the same would apply to the kind of research conducted on the teaching of reading and arithmetic.

Our examples thus far have been concerned with only one kind of thing to be taught, namely, concepts, in only two different kinds of curriculum, namely, reading and arithmetic. But the argument can readily be extended to many if not all of the different kinds of things to be taught in many if not all of the different kinds of subject matter. Thus, the teaching of principles in composition should by this kind of reasoning be found to be highly similar to, if not identical with, the teaching of the principles in science. The principle that the subject and the verb of a sentence should agree in number is, by this kind of logic, basically the same as the principle that one side of a chemical equation should contain the same number of atoms of whatever elements are involved as the other side of the chemical equation. The rule that the final e in a French word is silent, unless it has an acute accent, is in principle no different, as something to be learned and taught, than the rule that, as distance from the equator increases, the mean daily temperature on earth tends to decrease.

Nonetheless, in some subject matters, specific teacher competencies have been identified. For example, Lester (1973) listed teaching skills in mathematics instruction in the General Catalog of Teaching Skills edited by Turner (1973). These teaching skills are specific to mathematics instruction for the most part because they require a knowledge of mathematics. At their general level, they sound much like skills that would apply to the teaching of any subject matter. For example, one of the skills identified by Lester is "Identifies student process or skill errors and error patterns." Only when he cites indicators of this skill does it begin to seem curriculum specific, as when he states that the teacher, after viewing a film or videotape of a student mathematical activity, should be able to generate a hypothesis concerning possible error patterns and construct a diagnostic activity or test to test the hypothesis. For these indicators, the teacher would indeed need curriculum--specific skills.

Thus these curriculum-specific teaching competencies entail a knowledge of the subject. Yet several studies (e.g., Begle, 1972; Hook, 1965; McCall, & Krause, 1959; Rothman, Welch, & Walberg, 1969) have shown that the correlation between teacher knowledge and student achievement in various subject matters is just about zero. On the basis of a complex study employing path analysis, McDonald and Elias (1976) speculated that "A conception consistent with the data is that measures of knowledge of the subject and of [teaching] methodology are antecedents of [teacher] performance, but probably interact with the perceptual-cognitive processes of the teacher to affect teaching performance" (p. 934). And the path from teacher performance to pupil achievement becomes similarly complex.

In his executive summary report, McDonald (1976) characterized the curriculum-specific variable of teacher knowledge of subject matter as follows:

> Another area requiring refinement in measurement is the pattern of relations between teachers' knowledge of subject matter and their knowledge of teaching methodology. Probably the appropriate procedure would be to consider what is to be taught, working back from this analysis to a description of what a teacher ought to know in order to teach. A clear distinction should, however, be made between knowledge of content and knowledge of process. [In relation to teaching reading, it should be noted that,] Teachers generally have already acquired basic decoding skills and are competent readers themselves. But they may not, however, be informed about the processes involved in how pupils acquire decoding and comprehension skills (p. 56, italics in original).

Thus, the Lester and McDonald approaches illustrate senses in which certain teaching competences are highly likely to be curriculum-specific.

Further, we should consider the paper, "The Psychology of School Subjects: A Premature Obituary?" in which Shulman (1974) argued in favor of curriculum-specific research on teaching. First he cited the example of his research on physicians' diagnostic thought processes. He noted that physicians used hypothetico-deductive methods much more than did the subjects in the experiments on problem solving in the Study of thinking by Bruner, Goodnow, and Austin (1956). He attributed this difference in thought processes to the fact that the physicians had a body of knowledge that enabled them to stand the cognitive strain of entertaining several different hypotheses simultaneously. Thus, curriculum-specific research on medical diagnosis yielded results different from those of the generic research on

the knowledge-free tasks used by Bruner and his co-authors.

Second, Shulman noted that Curtis, in his summary of the investigations in the teaching of science between 1931 and 1937, had observed that, since his first summary dealing with studies as early as 1910, there had appeared a tendency toward concern with science teaching in general rather than with particular courses of instruction. Third, Shulman observed that William Brownell had argued in 1948 that, even though the same general types of learning go on in all of the various subject matters, the specific types of "arbitrary associations," "skills," "concepts," and "pupil behavior" differ from subject to subject and within the same subject. These differences occur in the "intrinsic relations" among the elements of the subject matter, "the opportunities afforded for the use of previous experience," and the complexity and difficulty of the things to be learned (Brownell, 1948). In short, although Brownell recognized the essential similarity across subject matters of the things to be learned and of the processes by which they would be learned, he stressed the possibly great importance, despite this similarity, of the differences from one subject matter to the next. Thus, research on teaching and learning should, it seemed to Brownell, be curriculum-specific.

Fourth, Shulman (1974) noted that E. L. Thorndike and Charles Judd had also differed on the question of generality versus specificity. Thorndike had upheld the general approach and Judd the subject-specific approach. Fifth, Shulman pointed out that the general approach of the original taxonomy of education objectives (Bloom, Ed., 1956) has been converted into a set of several subject-specific taxonomies in the 15-year-later handbook of evaluation (Bloom, Hastings & Madaus, 1971).

In all these ways, Shulman developed an impressive case for the renewal of curriculum-specific research on teaching. Such research would require the collaboration of subject matter specialists and psychologists. Left alone, psychologists would continue to follow the spurious general, non-curriculum-specific approach toward which most of them had tended during the preceding few decades.

The Multiplicity of Contexts

The argument in favor of generic research on teaching also rests on the problem of defining the proper degree of any specificity of such research, if curriculum-specific research is to be attempted. The problem is readily seen. How specific does "curriculum-specific" mean? Is a given curriculum the same as a subject matter, such as reading, arithmetic, science, or social studies? Or does a curriculum also need to be specified as to its grade level, so that we should think in terms of first-grade reading, second-grade reading, third-grade reading, etc.? If so, then, merely with respect to the reading curriculum, we would have 8 or 12 curricula, depending on whether we are concerned with reading in 8 or 12 grade levels. In mathematics, we would also have 8 or 12 curricula. And the same logic could be applied to the other major subject matters.

If we concern ourselves merely with the five major domains of subject matter--language arts, mathematics, social studies, natural science, and foreign languages--then we have specified, even at this crude and gross level of specification, perhaps 60 (5 subject matters x 12 grade levels) curriculum-specific fields of research on teaching. To do research in each of these 60 fields implies that we expect to find different relationships between process variables (e.g., types of teacher behavior or teaching method)

and product variables (e.g., types of student achievement and attitude). Thus, we would be assuming and implying that 60 sets of laws, generalizations, or types of relationships will be found between process and product variables--one set for each of the 60 subject matter-grade level combinations.

Surely, this degree of complexity will enormously expand and make more perplexing the kinds of lessons to be learned from research on teaching. It will be far from sufficient to have the kind of generalization that is currently attempted in research on teaching--a generalization such as "Degree of enthusiasm is substantially and positively correlated with student achievement and attitudinal favorability in learning from teachers' extended oral presentations (e.g., lectures or explanations)." The correlation or functional relationship between enthusiasm and student achievement would need to be reexamined in all of the 60 contexts noted above.

But, of course, even this 60-fold level of complexity is far from adequate to embrace what is meant by serious formulations of the idea of curriculum specificity. Within each subject matter, the concepts, principles, facts, definitions, types of problems, and the like, must themselves be specified. In this way of thinking, for example, learning and teaching the concept of consonant is in principle a somewhat different matter from that of learning and teaching the concept of plural (versus singular). That concept, in turn, is a different matter from the concept of present tense (versus past tense). That concept in turn differs significantly from that of phrase (versus clause, sentence, and paragraph).

Even within a single subject matter at a single grade level, the number of things to be learned, into which the curriculum can be analyzed, quickly becomes very large. Some applications of this kind of curriculum

analysis, as in the attempts on the part of some writers to formulate behavioral objectives for each of the school subject-grade-level combinations, turn out literally thousands of objectives. And each of these thousands of objectives is to be attained in any given grade-level subject-matter combination, such as first-grade reading, third-grade arithmetic, fifth-grade social studies, or ninth-grade science.

Specified at this level, research on teaching could readily become the search for the best method of teaching a single fact or concept or principle at a given grade level. And methods of teaching would then be studied at the corresponding level of specificity. Experiments would be performed on the best ways of teaching the concept of plural versus singular in the first grade, even versus odd number in the second grade, peninsula versus isthmus in the fifth grade, or the concept of moment of force in the ninth grade science class.

In short, without any sense purporting to argue from a reductio ad absurdum, we find that research on teaching in this view could readily become the search for relationships between process and product variables in thousands of different subject matter-grade level contexts. This is what results when the curriculum is analyzed into the specifics with which teachers and pupils actually work in any given lesson or unit during any single day or week of the school year.

The Conceptualizations of the Pedagogical Domain

Another kind of argument against the curriculum-specific approach to research on teaching stems from the fact that many of the concepts formulated by scholars in the field of teaching have served the purposes of those

scholars without requiring any substantial modification to take account of the specific curriculum or subject matter being taught. When it comes to analyzing teaching into its various "moves," "skills," "methods," "styles," and the like, these scholars have been able to formulate concepts that operate well in a variety of different contexts--subject matter, grade level, curricular, and organizational--with modification in terms of the particular context being studied.

An example of this kind of generality is the set of "moves" formulated by Bellack, Kliebard, Hyman, and Smith (1966). In studying "the language of the classroom" in 15 eleventh-grade social studies classes in New York City, they were able to put classroom teaching moves into four major categories: structuring, soliciting, responding, and reacting. During the following decade, that analysis of the types of moves was found useful in about 35 related studies describing teaching at every grade level from elementary through college; in subjects as varied as reading, arithmetic, mathematics, business, science, teaching, and nursing; in six other countries (Sweden, Finland, Australia, Germany, Canada, and Japan); and in such varied settings as individualized instruction, mathematics in "open" elementary school classrooms, and early education programs. In all these studies, the pattern of structuring, soliciting, responding, and reacting was found to occur in clearly defined ways (Bellack, 1976).

Similarly, in developing A Catalog of Concepts in the Pedagogical Domain of Teacher Education, Hudgins (1974) was able to proceed in an essentially curriculum-generic manner. The purpose of his catalog was to provide a set of intellectual tools by means of which practitioners could

isolate areas of difficulty and subsequently comprehend and interpret them. He defined the pedagogical domain as encompassing the settings and people that influence the content to be taught to pupils and the methods and procedures used to convey content. The pedagogical domain includes decisions concerning choice of content and its communication. The pedagogical domain also includes relationships with other teachers, with administrators, boards of education, and other community groups. But Hudgins gave priority to those concepts that apply most immediately to the daily tasks of teaching, especially the interactive aspects of teaching that go on as part of the classroom activities of teachers and pupils. The catalog contains definitions, indicators, illustrations, and sources for approximately 100 concepts of this kind.

The catalog has sections referring to cognitive content categories, such as reception learning (including comparison, definition, description, explanation, fact-stating, generalization, quotation, and summary). Another cognitive content category is productive thinking (including categorizing, comparing, evaluating, explaining, generalizing, and opining). It also contains treatments of concepts defined in terms of control of content, such as content organizing (discussion teaching, lecturing, routine, sequencing, and textbook teaching), process regulating (14 categories), and performance rating (3 categories). Then it contains chapters dealing with concepts about groups (including aggregation, classroom group, control of groups, group alerting, group cohesiveness, and teacher flexibility), group morale, and group productivity. It contains a chapter on concepts concerning individuals, such as achievement motivation, authoritarianism, conformity,

self concept, sexual status, socioeconomic status, and sociometric status. Finally, the catalog contains a treatment of the teacher as tutor or counselor.

What is significant concerning this catalog for the present issue is the striking fact that this treatment of concepts in the pedagogical domain proceeds without any curriculum specificity whatsoever. The illustrations of the concepts are, indeed, curriculum-specific. They deal with all of the subject matters and grade levels. For example, in illustrating the concept of comparison, the catalog provides the following example: "As response to a teacher question following the teacher's presentation on closed plane figures, a pupil says, 'A triangle has only three sides but a square has four.' Such a statement is a comparison inasmuch as the original comparison was expressed in the teacher presentation" (Hudgins, 1974, p. 29). In illustrating opining, the catalog offers the example that "A pupil states that he believes that there is life on Mars. He may even speculate as to the nature of such life. He does so, however, in the absence of any very specific evidential criteria" (p. 49). In illustrating the concept of generalization (a statement in which a pupil recounts a general principle, rule, trend, prediction, or conclusion), the catalog offers the following:

> A pupil rearranges the following sentence: "They were startled by a school of fish bailing water from the canoe." Thusly: "Bailing water from the canoe they were startled by a school of fish." When asked to cite the rule that he has applied the pupil responds, "You are supposed to place modifying phrases and clauses as close as possible to the words they modify" (pp. 38-39).

Thus, this fairly thorough and exhaustive attempt to catalog types of teacher behavior in the interactive aspects of classroom teaching was made without reference to curriculum-specific aspects of teaching. The catalog itself draws upon and cites a number of similar sources that have made similarly generic rather than curriculum-specific analyses of teaching (e.g., Aschner & Gallagher, 1965; Smith & Meux, 1962; Smith, & others, 1967; Taba & Elsey, 1964).

One additional illustration of the way in which the "activities of teaching" can be analyzed without becoming curriculum-specific is provided by Green (1971). He categorized one list of teacher activities as logical acts (e.g., explaining, concluding, inferring, giving reasons, amassing evidence, demonstrating, defining, and comparing); strategic acts (e.g., motivating, counseling, evaluating, planning, encouraging, disciplining, and questioning); and institutional acts (e.g., collecting money, chaperoning, and patrolling the hall). He regards the institutional acts of teaching as not necessary to the activity of teaching. The logical and strategic acts of teaching are, however, considered essential to the activity of teaching. Further, performance of the logical acts of teaching should be appraised on logical grounds, while performance of the strategic acts of teaching is appraised by its consequences for learning. Subsequently, Green distinguishes between "teaching that..." and "teaching to...." The former refers to shaping belief and knowledge, while the latter refers to shaping behavior. It involves the distinction between thinking and knowing, on the one hand, and doing or acting, on the other. This distinction is related to that between teaching and training, and Green's analysis leads to the principle that:

> In the proportion that the behavior aimed at in training manifests intelligence, it is easier to use the word "teaching" and "training" interchangeably; in the proportion that the behavior aimed at does not manifest intelligence, the term "training" continues to have application when the concept of "teaching" does not (Green, 1971, p. 25).

Green goes on to make similar analyses of the distinctions between training and conditioning, and between teaching and indoctrinating. These distinctions are involved with the degree to which different weights are placed on the grounds of belief as opposed to the content of belief.

The point here is that, at a certain level of analysis, the nature of the curriculum, or the objectives at which education is aimed, becomes important for the determination of the degree to which teaching, training, indoctrinating, conditioning, or instructing goes on. And if "teaching is an activity primarily concerned with enlarging the manifestation of intelligence" (pp. 32-33), then teaching is more appropriate for certain kinds of objectives than others. If certain beliefs, knowledges, associations, and the like, are to be acquired on <u>rational</u> grounds, then certain kinds of teaching are appropriate. On the other hand, if they can be acquired on arbitrary, <u>irrational</u>, automatic, and unthinking grounds--such as the learning of the Morse code or the proper movements for serving the ball in tennis--then different kinds of teaching (or perhaps not even "teaching" at all) are entailed. Thus, by this analysis, we have the beginnings of the justification for a curriculum-specific approach to teaching and to research on teaching.

The Evidence from Process-Product Correlations

Much of the foregoing analysis of the issue of curriculum specific versus generic research on teaching is based on logical and a priori considerations. Another kind of consideration may be termed empirical. Does research actually indicate that relationships between process and product variables--i.e., between some kind of teacher behavior and some kind of student achievement--differ when subject matters differ? An example of this kind of difference according to the "context" in which the teaching goes on has been offered by Brophy and Evertson (1976). They found that many kinds of teacher behavior had a positive relationship to student achievement in reading or mathematics or both, at the second and third grade levels, when the teacher taught in a school consisting primarily of children of lower socioeconomic status. And the same kind of teacher behavior had a negative relationship to the same kinds of student achievement in schools where most of the pupils came from families of middle or higher socioeconomic status.

It is this possibility that relationships between variables differ in magnitude and direction that creates the strongest empirical argument in favor of curriculum-specific research on teaching. If a certain kind of teacher behavior has one kind of relationship to pupil achievement in reading and another kind of relationship to pupil achievement in arithmetic, it is obvious that research on that kind of teacher behavior must be curriculum-specific.

What has the research shown on this possibility? One of the foremost reviewers of the process-product studies of teaching has written as follows (Rosenshine, 1974):

> I did an informal look at two contextual variables--grade level and subject area--by consulting the tables in my book on teaching behavior and student achievement (Teaching Behaviours and Student Achievement, 1971). Each study in those tables is listed by grade level and subject area, and one can use this information to reorganize the tables to determine whether the overall results would be different or distinct for any grade level or subject area. When my students and I did this, we found, first, that there were a large number of blanks for most of the combinations of grade level and subject areas. We also found that none of the results which were obtained were particular to any combination of grade level or subject area. Thus, the overall results on teacher questions, for example, are unchanged if one divides the tables on questions according to grade level or subject area; the results on clarity or on task orientation appear significant across all grade levels and subject areas reported (p. 6).

Another instance of the same kind of generality across subject matters is to be found in the report by Brophy and Evertson (1976). They reported that

> although teachers differed among themselves in their relative success, these differences tended to be rather general across subject matter areas. A teacher who consistently got good gains in language arts ordinarily got good gains in mathematics also, and a teacher who consistently got poor gains in language arts usually got poor gains in mathematics. Few teachers consistently got better gains in one of these subject areas than in the other (pp. 165-166).

Similarly, Stallings (1975, pp. 100-101) reported that similar relationships to achievement in reading and mathematics were found for such variables as length of school day, average time a child spends on the given subject (reading or mathematics), amount and frequency of discussion of the subject matter with adults (teachers or aides), degree of systematization of the instructional pattern in the form of the teacher's providing information and asking a question about that information, etc. Indeed, the separate paragraphs in which Stallings summarized the results for reading and with achievement are worded almost identically except for the reference in one section to reading achievement and in the other to math achievement. There are references to subject matter-specific teaching methods such as Cuisenaire rods but they do not change the general picture of great similarity concerning what teaching variables correlated positively or negatively with achievement in reading and math in these Follow Through Classrooms.

On the other hand, McDonald (1976) concluded that no teaching practices correlated with pupil achievement in both reading and mathematics at the second- and fifth-grade levels. And, with respect to another kind of generality, Brophy and Evertson (1976) reported many differences in the direction of process-product relationships between classes of middle socioeconomic status and those of low socioeconomic status.

Thus, the preponderance of evidence thus far favors generality across academic subject matters (McDonald's findings being the main exception) and specificity for socioeconomic levels (Brophy and Evertson alone having addressed this question). But the evidence is far from adequate. Closer

examination of the ever increasing pertinent literature might now either strengthen or modify the picture favoring generality, especially as a broader range of subject matters, grade levels, socioeconomic levels, and other aspects of context are taken into account. More of the "blanks" that Rosenshine (1974) found in the subject matter-gradelevel matrix may now be filled in, and research needs to be done in the future to provide data on the cells that are still empty.

The Role of Curriculum Packages

Those, such as Shulman (1974), who have called for a revival of the psychology of school subjects, have not provided answers concerning the region between the possible extremes in which the most fruitful work can be done. Shulman called for joint efforts of subject-matter experts and psychologists. A few years earlier, Rosenshine (1971) had urged that instructional research be conducted within the context of curriculum materials packages, such as the UICSM materials, the SMSG Program, and so on. Such packages offer the great advantage of controlling, from one classroom to another, the materials, sequences, topics, concepts, and activities with which teachers work. With such controls, research workers can focus much more sharply on the variations that are introduced by teachers and can then attribute variations in student achievement much more justifiably to what the teacher has done. As is well known, curriculum programs that have produced such packages of curriculum materials have not succeeded in controlling the ways in which the packages are actually used in classrooms. Curriculum-specific research on teaching could proceed either correlationally, by observing what teachers do with the curriculum materials packages, or experimentally, by training the teachers to use those packages in discrete

ways. In either case, the findings would be significant at a meaningful point between the extremes of generality and specificity.

Here again, we face the problem of whether we can hope for knowledge that will have some general value. Since curriculum packages exist in great numbers, must we resign ourselves to the evaluation of teaching in relation to each package by itself? Or can we hope for generalizations about teaching that cut across more than one curriculum materials package at a time?

The answer here will have to be determined by experience. But the implications for research strategy should be fairly clear and acceptable. Should we start at the most general level, as psychologists have tended to do, with laws of learning that apply to all behavior, or to all subject matters, or to all kinds of things to be learned, whether they are concepts, or principles, and so on, and then come down to more specific levels as these are dictated by the particularities of specific curricula? Or, instead, shall we do better to begin at the curriculum-specific level, establish firm generalizations about the best ways to teach with a specific curriculum materials package, and then determine the degree to which those findings can be generalized or transferred to another curriculum materials package, and so on? Such an orientation of working our way up from the specific to the general has the advantage of yielding more quickly useful findings at the specific level where teachers work in any given subject in the classroom. With the most important subjects, such as reading and mathematics, we can thus obtain from the very beginning knowledge that has practical value, even if it does not yet have scientific generalizability. The opposite procedure,

of working our way down from the most general level, may make us run much greater risk of obtaining knowledge that may not apply to the practical realities of teaching a specific curriculum to a given kind of student.

A thoughtful analysis of the role of curriculum packages as a contextual variable in the study of teacher behavior has been made by Rosenshine (1974). That analysis opens up the possibility that such packages may so thoroughly control teacher behavior that they leave little room for individual differences among teachers using the same curriculum package. In that event, the study of process-product relationships in teaching may become genuinely reduced to the study of curriculum package-product relationships.

On the other hand, certain curriculum packages, if not all, may leave enough leeway for variations in teacher behavior to make the study of process-product relationships within curriculum packages still worthwhile. In that event, such relationships should be studied within the context of a single curriculum package to determine whether different ways of implementing that package make a difference in what students learn.

A Proposed Resolution

For the purposes of strategy in research on teaching, the resolution of the general-specific issue will probably be shaped in large part by the research-support policies of governmental agencies, foundations, and other sources of funds with which to do the work. That support-sources influence the paradigms used by social and behavioral scientists not only seems plausible but it has been demonstrated empirically. In an analysis of government sponsorship on research paradigms in the social sciences, Useem (1976) showed that government priorities differed from those defined by the workers within various disciplines. And the government's priorities tended

to prevail, at least when the situation is judged by the results of a survey of more than a thousand faculty members in the fields of anthropology, economics, political science, and psychology. More of the investigators in each field considered their research to be relevant to policy if their research was federally funded than if it was not. Similarly, the respondents' research was more likely to be quantitative, involving statistical tests and computer-aided analysis, if it was federally funded than if it was not. The discipline's own priorities and preferred methodologies were measured in terms of the citation rates of the social scientists. It was found that the correlations between amount of federal funding and policy relevance or quantitativeness was unaffected by controlling for citation rate. Hence it was concluded that the government's substantive preference (policy orientation) and methodological preference (quantitativeness) prevailed over those of the discipline itself. "The federal government is allocating its research money in line with topics and methods that are not identical to the discipline's self-defined priorities" (Useem, 1976, p. 153).

Within educational research, there is, as Berry (1977) has pointed out, the same conflict between the discipline-oriented research community and the policy-oriented federal agency, such as the National Institute of Education. The policy orientation is dictated by the Congress and the Executive Branch. Nonetheless, within the NIE there has been a consistent effort to support basic research and knowledge synthesis--an effort that succeeds only insofar as NIE receives appropriations close to those that it requests.

Thus, the long-run decisions on the general-specific issue in research

on teaching are likely to be determined by government agencies. But how, in turn, are the beliefs and priorities of the government agencies determined? Here, as Berry noted, many forces other than the researcher workers' opinions, values, and beliefs operate--forces préeminently represented by the members of Congress, the Executive Branch, and especially their technical aides and staffs. Thus the voices of research workers must be heard by the government agencies that have the responsibility for determining how public monies for research will be spent. It was in the attempt to be heard in this way that a distinguished medical scientist, the Nobel Laureate Arthur Kornberg, stated that

> Basic research, the lifeline of medicine, is now threatened by strong social, economic and political pressures....
>
> These pressures come from within institutions as well as from outside....They discourage financial support of basic research and question its importance. They drive scientists to undertake excessively complex problems in a gamble for quick payoffs. They make scientists into entrepreneurs and administrators.
>
> ...The scientist or practitioner of medicine...must adhere to the fundamental discipline of science...and persist at it doggedly year in and year out.
>
> One of the problems...has been the impatience of the politicians with basic research. They have called for crusades to vanquish cancer and heart disease without regard to the fact that we lacked the weapons to conduct such major wars (Campus Reports, Stanford University, March 16, 1977, p. 7).

The present statement on the general-specific issue must, if it is to serve its purpose, constitute a similar attempt to influence the determination of research-support policy. The resolution here proposed is that research should be concentrated in a relatively small number of conjunctions of grade-level, subject matter, and socioeconomic level. These conjunctions have in recent years consisted of reading and mathematics of the primary grade levels in schools serving children relatively low in socioeconomic level--in short, a combination of contexts exemplified by the Follow Through program. The concentration of resources on this particular educational context has reflected national priorities widely accepted since at least the mid-1960's. That concentration has resulted in the accumulation of a relatively large, consistent, and firm body of findings concerning the kind of teaching that works best in that context--in that combination of subject matters, grade levels, and socioeconomic settings. Although the findings are not yet completely firm, they represent a convergence much stronger than that to be found in other contextual combinations that have not received the same concentration of Federal support.

The recommended resolution of the issue is thus that research on teaching should indeed be concentrated in relatively specific contexts that reflect the most urgent national educational needs. Broader vision will presumably elevate other subject matters, curricula, grade levels, and cultural groups to the same level of attention that has been focused on what the Follow Through program represents.

This is not the proper place for the attempt to determine what that context for research on teaching should be. It is appropriate here only to

indicate that some context should be chosen by research-support agencies as the target for effort in research on teaching. The medium-range strategy would be that of determining whether the same variables, or types of variables, yield the same results in the new context that they have yielded in the context of teaching reading and math in the primary grades to lower SES children. New variables specifically promising for the new contest will, of course, also be tried. As the results from a relatively large number of projects begin to come in, the picture of effective teaching in the new context will come into focus. If it resembles the picture from the Follow Through context, the knowledge on the general-specific issue will reach a higher level of precision and empirical support. If it differs markedly from that picture, we shall know more about the limits of the kinds of variables in teaching with which our present conclusions deal.

In a word, the present analysis leads to a confirmation of the wisdom of one part of Federal policy of the last decade in guiding research on teaching: support should be concentrated on relatively specific combinations of subject matter, grade level, and cultural background. That concentration should not however, be complete. Other combinations should not be ignored if there is high merit in the proposals, ideas, and hypotheses for research in those contexts. But, in a time of relatively scarce research-support resources, some concentration of those resources along context-specific lines seems advisable.

Conclusions to the effect that past research-support policies have been wise do not always come from research workers. The basic and perhaps inevitable tension between research-support providers and receivers often results in a condemnation of government and foundation bureaucrats by

the research workers who see themselves as beleaguered by overly restrictive, short-sighted, and coercive policies. That view of the bureaucrats may well be justified in many other aspects of the way in which research on teaching has been governed. But, on the general-specific issue in research on teaching, at least, the present argument leads to an affirmation of the relatively specific approach of a large part of Federal support of the past decade and a recommendation of its continuance into the next decade or so.

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